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# Prevalence of Bovine Trypanosomosis and Distribution of Vectors in Hawa Gelan District, Oromia Region, Ethiopia

*[1]Tewodros Fentahun, [2]Mitiku Tekeba, [3]Tadegegn Mitiku and [4]Mersha Chanie*

[1]University of Gondar, Faculty of Veterinary Medicine,
Unit of Basic Veterinary Sciences, P.O. Box 196, Gondar, Ethiopia
[2]Oromia Regional State Agricultural Office, West Wolega Zone,
Hawa Gelan Distric Agriculture Office
[3]University of Gondar, Faculty of Veterinary Medicine,
Unit of Veterinary Clinical Studies, P.O. Box 196, Gondar, Ethiopia
[4]University of Gondar, Faculty of Veterinary Medicine,
Unit of Veterinary Paraclinical Studies, P.O. Box 196, Gondar, Ethiopia

**Abstract:** A study was conducted in tse tse controled ''Mada Talila'' and non- controlled (''Gudina Wacho'') of ''Hawa Gelan'' district commencing September 2011 to December 2011. The objectives of the study were to determine the prevalence of Bovine Trypanosomosis and to assess distribution and apparent density of vectors. The Buffy coat technique was used for the detection of parasites and deployed traps for the detection of vectors of Trypanosomosis were used. 388 blood samples from cattle (176 in control and 212 in non-control kebeles) were examined. Parasitological findings revealed that prevalence of Trypanosomosis was 9.1% in ''Mada Talila'' whereas 15.1% in ''Gudina Wacho'' though statistically significant difference was not observed ($P^2$=3.197, p=0.07). The overall prevalence was 12.4%. Of the total infected cattle, 45.85% and 33.33% was *T. vivax* and *T. congolence* respectively ($P^2$=17.54; p=0.016). The mean PCV values of parasitaemic and aparasitaemic animals were 23.3 + 3.7 SD and 25.95 +3.9SD respectively ($P^2$ =0.932, p=0.007). About 20 mono-conical traps (8 in control site and 12 for non- control site) were deployed for 72 hours. A total of 1,428 flies were collected; (11.9 fly/trap/day) tse tse and (10.2 fly/trap/day) Stomoxys, (0.9 fly/trap/day) Tabanus and (0.8 fly/trap/day) others which had significant difference ($P^2$=348.4; p=0.00). Finally, implementing control of trypanosomosis with an integrated approach is essential components for sustainable development and strengthens the settlement programs of people from drought vulnerable areas.

**Key words:** Cattle % Hawa Gelan % Prevalence % Trypanosomosis % Tsetse Fly % Western Ethiopia

## INTRODUCTION

Trypanosomosis is a complex disease of protozoa that is caused by different species of unicellular parasites (trypanosome) found in the blood and other tissues of vertebrates include livestock, wild life and people [1]. Bovine trypanosome is one of the disease that caused by this flagellated protozoal parasite belong to the genus trypanosome. Trypanosomosis limited the extension of natural herds particularly in Africa were the presence of the tse tse fly density access to woodland and savanna areas with good grazing potential [2]. It is a serious constraint to agricultural production in extensive areas of the tse tse fly infested Ethiopian low lands [3]. Over 10 million kilometers of the Tropical African is infested by tse tse fly [4].

These wide ranges of the tse tse and tryponomosis survey were carried out in Didesa and Abay river system [5]. According to Nttic [5], Tsetse transmitted animal trposonomosis still remain as one of the largest causes of livestock production losses in Ethiopia. About 15-20% of the land believed to be suitable for livestock production

**Corresponding Author:** Tewodros Fentahun,University of Gondar, Faculty of Veterinary Medicine,
Unit of Basic Veterinary Sciences, P.O. Box 196, Gondar, Ethiopia.

is affected by one to two species of tsetse flies [6]. The effects of trypanomosis is not only the direct losses resulting from mortality, morbidity, infertility of the infested animals and costs of controlling the disease but also due to indirect losses, which include exclusion of live stock and animal power based crop production from the huge fertile tse tse infected areas [7].

According to Tadele [8], in Ethiopia about 14 million heads of cattle are exposed to risk of tyrpanosomosis. It is not only the loss in meat and milk production of animals recovering from the disease but the great damage caused by the disease in that has hundred thousands of hector of land unfit for settlement and cultivation. In addition some drugs applied to treat the diseased animals developed resistance and they are costly. Therefore, the major objectives of this paper were to determine the prevalence of Bovine Trypanosomosis and to determine the species and relative magnitude of vectors of Tryanosomosis in Hawa Gelan district of Kellem Wollega zone.

## MATERIALS AND METHODS

**Study Area:** The study was carried out in Hawa Gelan district in Kellem Wollega Zone of Oromia Regional State, Western Ethiopia. The study sites were disease control implemented settlement area (Mada Talila kebele) and disease un-controlled settlement area (Gudina Wacho kebele). The climate alternates with long summer rain fall (June to September) and winter dry season (October to May) with mean annual rain fall 1,400- 1,800mm. The agro-climate condition fall within tropical sub-humid climate and the altitude range from 1100- 2100m above sea level with daily temperature 10° C to 25°C [9].

The vegetation type of the area is characterized by Common river in vegetations. The area has reserved vegetations until the settlement program was practically applied. The areas are rich with wild game animals in main river system and savanna. Some of these wild animals are baboon, monkey, African Buffalo, Lion, Bush pig, Crocodile, Hyena, Snakes etc. The cattle populations of the district are estimated to be 68,664. The rearing system of cattle in study sites depends on natural grass and crop residues and kept in traditional management system [9].

**Study Design and Sample Size Determination:** A cross- sectional study was conducted to determine and compare bovine trypanosomosis and vector densities in the control and non- control implemented kebele of Hawa Gelan District of Kellem Wollega Zone. The age of the animals were categorized as young and adult according to De Lahunta and Habel [10] and Pace and Wakeman [11]. Simple random sampling technique was used to select cattle for blood sample collection for further study of the prevalence of Bovine Trypanosomosis in the study area. The sample size was determined based on the expected prevalence of Bovine Trypanosomosis in the area is 50% since there was no previous study conducted here and calculated by the formula given by Thrusfield [12].

$$n = \frac{1.96^2 \text{ x } P(1-P)}{d^2}$$

where,

n = The sample size
p = The expected prevalence
d = The desired absolute precision

According to the formula, 388 blood samples were proposed, but to increase the precision, a total of 388 cattle (176 from control implemented and 212 from non- control implemented kebeles) were sampled.

**Study Methodology**

**Parasitological Study:** About 388 local breed cattle 212 in (non-control implemented kebele) and 176 in Mada Talila (control implemented kebele) were examined for the determination and comparison of the prevalence of trypanosomosis. The animals were categorized in to two age groups as young and adult. The Buffy coat technique (Haematocrit Centrifugation Technique) was used for the detection of parasites and thin smear were prepared for positive sample for species identification [13].

Sample collection was done by piercing the marginal vein of cattle with a sterile lancet and bloods from the ear vein drawn by a Heparinized Capillary Tube at least its ¾$^{th}$ of volume and was sealed at one end with crystal seal [13]. The lancet was cleaned with cotton after bleeding each animal so as to prevent cross contamination of the sample. After first 24 samples are taken, The capillary tubes were placed in the centrifuged at 12,000 or rpm (revolution per minute) for 5 minutes, when the centrifugation process ends the Packed Cell Volume (PCV) was read and recorded in the survey format [1]. To identify the species of trypanosomes, morphologically and its density (degree of infestation) for the positive cases, thin blood smear technique was used [1, 13].

**Entomological Study:** The apparent density of tse tse fly and other biting flies in relation to altitude and vegetarian type were studied at selected sites of the study area. The apparent density was determined based on the mean catches in traps deployed and expressed as the numbers of fly catch/ trap/ day. The flies were caught with mono-conical traps baited with acetone, octanol and cow urine which are odor attractants for tse tse flies in river in were also used [4].

A total of 20 traps, 12 in Gudina Wacho kebele (non- control implemented) and 8 in Mada Talila kebele (control implemented) were deployed just before sun rise and in position for 72 hrs. The species of tse tse fly was identified based on morphological characteristics such as size, color, wing venation and proboscis is at the genus level. Sexing was done for tse tse fly just by observing the posterior end of the ventral aspect of abdomen by hand lenses as a result male flies easily identified by enlarged hypopygium and other biting flies will also be separated according to their morphological characteristics such as size, color and proboscis and venation structure at the genus level [3].

**Data Analysis:** The total prevalence rate was calculated by dividing the number of positives by the total number of animals examined in the area. Descriptive and analytical statistics such as Chi-square test and regression analysis were used. The pattern of packed cell volume (PCV) between infected and non infected animals, the prevalence rates of Bovine trypanosomosis between control implemented and non- control areas, age and sex of animals' distribution and densities of the vectors of trypanosomes in the area were compared [13].

## RESULTS

**Parasitological Finding:** 388 cattle examined, 48 (12.4%) were found positive. The prevalence were (9.1%) in Mada Talila kebele (control site) and (15.1%) in Gudina Wacho kebele (non-control site) which has no statistical significant difference observed between the control implemented and non-control implemented kebeles ($P^2$ =3.197, p=0.074) though the higher prevalence was found in the Gudina Wacho kebele (15.1%) (Table 1).

There were no statistically significant difference observed between the two sex categories of controlled sites ($P^2$ =1.18, p=0.270) and non-controlled sites ($P^2$ =0.036, p=0.850). However, there was higher prevalence recorded in male than female from controlled and non-controlled sites; 11.22% and 15.2% respectively (Table 1 and 2).

There was statistically insignificant difference observed in prevalence between the two age categories of cattle in both kebeles ($P^2$ =0.090, p=0.764). However, relatively higher prevalence of trypanosomosis is observed on young (12.96%) cattle than adult (11.96%)(Table 3).

The proportion of trypanosome infection with species level indicated, 16(33.33%) cattle were found to be infected by *T. congolence*, 22 (45.85%) cattle were found to be infected by *T. vivax* and 10(20.83%) cattle were found to be infected by *T. bracei*. The presence of high prevalence of *T. vivax* is an indicator of the importance of mechanically transmitted trypanosome in area where tse tse control program is undertaken (Table 4).

Table 1: Prevalence of Bovine Trypanosomosis in the Controlled and Non- Controlled sites.

| Kebele | **m** of animals examined | **m** of positive animals | Infection Rate (%) | $P^2$ | P-value |
|---|---|---|---|---|---|
| Mada Talila (Control area) | 176 | 16 | 9.1 | 3.197 | 0.074 |
| Gudina Wacho (Non - Control area) | 212 | 32 | 15.1 | | |
| Total | 388 | 48 | 12.4 | | |

Table 2: Prevalence of Bovine Trypanosomosis in the controlled and Non- controlled kebeles based on sex categories

| Kebele | Sex | **m** of animals examined | **m** of Positives | Prevalence rate (%) | $P^2$ | P-value |
|---|---|---|---|---|---|---|
| Mada Talila (Control area) | Male | 98 | 11 | 11.22 | 1.218 | 0.270 |
| | Female | 78 | 5 | 6.41 | | |
| Gudina Wacho (Non - Control) | Male | 116 | 18 | 15.52 | 0.036 | 0.850 |
| | Female | 96 | 14 | 14.83 | | |
| Total | 388 | 48 | 12.47 | | | |

Table 3: Prevalence of Bovine Trypanosomosis in the controlled and Non-Control Kebeles based on Age groups

| Age | **m** of examined | **m** of Positive | Prevalence (%) | $P^2$ | P-value |
|---|---|---|---|---|---|
| Young | 162 | 21 | 12.96 | 0.090 | 0.764 |
| Adult | 226 | 27 | 11.96 | | |
| Total | 388 | 48 | 12.4 | | |

Table 4: Prevalence of Bovine Trypanosomosis based on Species of Trypanosomes.

| Species | Total positives | No of positives for each Species | Percentage (%) | $P^2$ | P-value |
|---|---|---|---|---|---|
| *T.congulence* | 48 | 16 | 33.33 | 17.54 | 0.016 |
| *T. vivax* | 48 | 22 | 45.85 | | |
| *T. bracei* | 48 | 10 | 20.83 | | |

Table 5: The mean PCV value of Cattle in Controled and Non- control kebeles.

| Kebele | Mean PCV of Aparasitaemic animals (%) | Mean PCV of Parasitaemic animals (%) | Over all PCV (%) | $P^2$ | P-value |
|---|---|---|---|---|---|
| Mada Talia | 26.6 | 24 | 24.3 | 0.932 | 0.007 |
| Gudina Wacho | 25.3 | 22.6 | 23.95 | | |
| Total | 25.95 | 23.3 | 24.6 | | |

Table 6: The Distribution and Apparent Densities of Vectors of Trypanosomosis in Controlled and Non- Control kebeles.

| | | Files identified in number fly/traps/ day | | | | |
|---|---|---|---|---|---|---|
| Kebeles | No. of traps deployed | Tse tse | Tabanus | Stomoxy | Hematopota face fly | Total |
| Mada Talila | 8 | 8(0.3) | 23(0.9) | 247(10.3) | 24(1) | 302(12.6) |
| Gudina Wacho | 12 | 708(19.7) | 32(0.9) | 363(10.1) | 23(0.6) | 1126(31.3) |
| Total | 20 | 716(11.) | 55(0.9) | 610(10.2) | 47(0.8) | 1428(3.8) |

$P^2$=348.463; p=0.00

**Hematological Finding:** The overall mean PCV values of parasitaemic and aparstiaemic animals was 23% + 3.7SD and 26% + 3.9SD respectively with statically significant difference ($P^2$ =0.932, p=0.007)(Table 5).

**Entomological Findings:** A total of 1,428 flies were caught during the study period of which 302 from Mada Talila Kebele (controlled) and 1,126 from Gudina Wacho kebeles (non-controlled). The number and densities of the different files caught during the study period is shown in table 6. The highest fly density was found for tse tse flies and there was higher difference between control and non- control sites compared to to other biting files with statistically significant difference ($P^2$=348.463; p=0.00).

In Gudina Wacho kebeles, tse tse fly was caught from all the river valleys where the traps deployed (Hindina and Laga Lome). The altitudinal level where tse tse fly caught in the range of 1260-1567 meters above sea level. In Mada Talila kebeles, the higher catches of tse tse fly were caught in riverin vegetation areas such as Laga Kersa and Godare Rivers. The altitudinal distribution where tse tse fly caught was between 1337-1388 m above sea level. The altitudinal variations were traps deployed in the range of 1,269 -1,443 in both kebeles.

The highest fly catch was tse tse followed by stomoxys, tabanus and others indicating that tse tse transmitted trypanosomosis is a potential treat for the local farmers and also settlement people from other parts of the region (Table 6).

## DISCUSSION

Trypanosomosis is a major constraint to the utilization of large land resources and also affect livestock, cattle in particular as a major role in agriculture economy of Ethiopia. The introduction of draught oxen in to the resettlement areas in low land area was severely constrained by the spread presence of trypanosomosis [2]. The present study on prevalence of Bovine Trypanosomosis in Mada Talila (Control) and Gudina Wacho (non- Control) kebeles of Hawa Gelan District Kellem Wollega Zone has determined the prevalence of Bovine Tyrpanosomes were 9.1% and 15.1% respectively. The overall prevalence was 48/388 (12.4%). Even though there is high infestation of tse tse fly in the area, the prevalence is very low in Mada Talila and Gudina Wacho kebeles. This reduction in prevalence is due to the presence of high prophylactic treatment in the area.

The prevalence was 15.1% (32/212) in tse tse infested area (Gudina Wacho) and 9.1% (16/176) in tse tse free or controlled area (Mada Talila). The present result also indicated that the trypanosomosis encountered in tse tse infested area belongs to the species of both *T.vivax* and *T. congolence.* According to the annual report of Ntticc [6], the situation before control was very terrible in Gudina Wacho for instance rate of trypanosomes in cattle was about 31% in and around settlement area before control. But the prevalence is decreased in the tse ste control program.

The current study showed that there was no statically significant difference in infection rates between male and female cattle. Higher prevalence was recorded in male than female from controlled and non-controlled sites; 11.22% and 15.2% respectively.

Animals are not constant due to the farmers sold the male animals at frequency of 2-3 months after purchased. The high ratio of *T. vivax* may also be suggested that it has the ability to adopt and established it self in the absence of the tse tse flies and it transmitted by other biting flies. The reason when the number of *T. congolence* in both controlled and non- control area decreased in the present study was attributed to the fact those trypanosome species established them in cyclical transmission in the infested area than tse tse free area. This has also been reported by Leak [13]; greater proportions of infection are transmitted mechanically rather than cyclically in such area (tse tse free) and *T. vivax* is highly transmitted in this manner than other trypanosome species.

The current study also indicated that the difference between mean PCV values of parastaemic and aparasitaemic cattle of the study area was significant ($P<0.05$). The mean PCV value of parasitaemic animals 23%+ 3.7 SD and aparasitaemic animals was 26+3.9 SD. The mean PVC value were also significantly varied ($p<0.05$) both in control and non- control kebeles in respective of parasitaemic versus non-parasitaemic animals. Measuring the mean PVC value is one of the indicator of a herd infected with trypanosomosis and hence the anemic status of sampled animals showed anemia (reduced PCV) values in both control and non-control kebeles.

According to Getachew [2], 60% of *T. vivax* infected cattle in the high land showed anemia below a PCV value of 20% compared to 50% of *T. congolence* and *T. vivax* infected cattle in low land. It is known that the development of anemia is the most reliable indication of the progress of the trypanosome infection [14]. But it can also be assumed that numerous concurrent disease and nutritional factors interfere with in anemia development. Even though it is assumed as small PCV values are reliable indicator of anemia. Most of the mean PCV value levels indicated that the general health of the cattle was good and individual PCV of some animals vary (below the normal range of mean PCV value).

Regarding the case of apparently trypanosome free cattle with low PCV could be due to various concurrent disease and nutritional interference with development of anemia, conversely many cattle having high PCV also show to be infected in which it may be occurred due to recent infection. The risk of trypanosome is influenced by tse tse apparent density and infection rates in flies. Animals infected with trypanosomosis were not showing clinical signs were in good body conditions.

The distribution of tse tse fly is discrete and low population in tse tse controlled area Mada Talila due to the target performed before and due to examination of settlement and farms. In some areas, the cause of low tse tse density was due to dryness which had forced the game animals to move deep in to forest park and game reserved. On the contrary, higher densities of tse tse in non-control area (Gudina Wacho) found was a potential treat for control sites. It can be a source of reinvasion if the control method is not sustainable and recent control program is not applies. It was only *G. tachinoides* caught in the study area and this is also reported previously by various researchers that the dominant species of *Glossina* in the Hawa Gelan District is *G. tachinodides.*

## CONCLUSION

The present study indicated that trypanosomosis is an important disease limiting and would act as a source of infection for cattle in both Mada Talila and Gudina Wacho due to the presence of reverie species *G. techninoids*. The prevalence of trypanosomosis is significantly reduced and the fly density decreased compared to Gudina Wacho kebele where non-control activity is conducted so far. Therefore, a progressive control campaign aimed at reducing the tse tse fly density from the whole valley is necessary to minimize the effect of trypanosomosis.

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